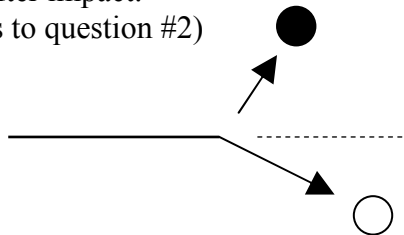


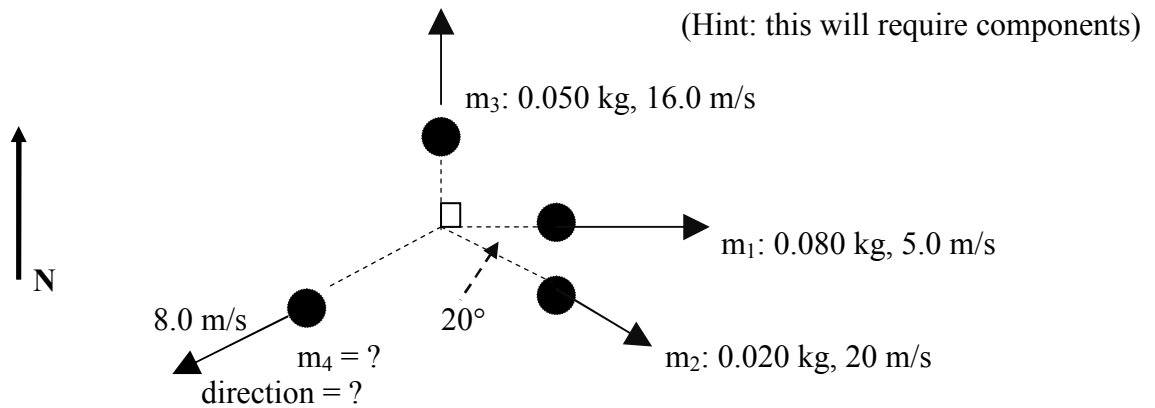
PHYSICS 12 IMPULSE & MOMENTUM WORKSHEET 2

1. A 95.0 kg football player carrying the ball and travelling at 8.50 m/s due South is pursued and tackled by a 110 kg defensive lineman who was approaching at 9.10 m/s from 60° E of N. Assuming that the lineman holds on, what is the resultant momentum and velocity of the two players immediately after the tackle is made?
2. A 0.050 kg bullet, fired at 320 m/s due East, collides with a target 2.0 kg steel weight and deflects off at 260 m/s, 40° S of E. Determine the momentum and velocity of the steel weight directly after the collision.
3. Two cars approaching each other collide at right angles and stick together. Car **A** has a mass of 1200 kg and was travelling due East at 15 m/s, while Car **B** has a mass of 1500 kg and was travelling due North. After the collision, they move off at 64° N of E. Calculate:
 - a) their momentum and common velocity after the collision.
 - b) the velocity of Car **B** *before* the collision.
4. A frictionless projectile puck of mass 0.80 kg travels at 4.0 m/s due South and strikes obliquely a stationary target puck of equal mass. After the collision, the projectile puck moves at 2.0 m/s in a direction that is 60° W of S.
 - a) Find the momentum and velocity of the original target puck after the collision.
 - b) What angle would you expect from two objects that collide obliquely? Is this the case here?
 - c) Was mass needed to determine the velocity in this problem? Explain.
5. A billiard ball collides obliquely with another of equal size and mass. After impact, the two balls move off, with the incident ball travelling at 8.0 cm/s at 30° to its original path. Find the velocity of the target ball after impact.
(Hint: consider the answers to question #2)



6. A 0.10 kg rubber ball traveling at 20. m/s strikes a vertical wall at 45° and rebounds off with no loss of speed.
 - a) Sketch the momentum vectors in a diagram, showing the vectors $\mathbf{p_i}$, $\mathbf{p_f}$ and $\Delta\mathbf{p}$ clearly.
 - b) Find the total change in momentum of the ball, in magnitude and direction.

7. A firecracker explodes into 4 pieces and they move as shown in the diagram. Find the mass of the piece m_4 and the direction in which it travels if its velocity is 8.0 m/s.



1. 920 kg•m/s, 4.5 m/s @ 70° E of S 2. 5.1 m/s @ 55° N of E 3. a) 4.1×10^4 kg•m/s, 15 m/s b) 25 m/s
 4. a) 2.8 kg•m/s, 3.5 m/s @ 30° E of S b) 90° ; yes, $30^\circ + 60^\circ = 90^\circ$ here c) no; if all masses are equal, 'm' cancels out
 5. 4.6 cm/s @ 60° from original line of motion 6. b) 2.8 kg•m/s straight back, \perp to wall 7. 0.13 kg @ 41° S of W